study, manual training and household science, and for advanced pupils to obtain instruction in agriculture, horticulture and allied subjects. It stimulates public interest in the schools and brings to the pupils of a township an institution in which all can have an equal interest and a worthy pride.

THE address given by Sir J. Wolfe Barry on Tuesday, as president of the Association of Technical Institutions, contained several instructive comparisons as to the position of technical education at home and abroad. For instance, he pointed out that while the matriculated students in German technical high schools number 15,442, the number in the whole of similar institutions and universities of Great Britain is only 3873. But it is not so much the number of students as the spirit in which scientific knowledge is regarded that is of importance to national progress. What is wanted, Sir J. Wolfe Barry remarked, is, first, that the highest intellects among us for research as applied to the arts should be rendered available, and secondly, the best possible directing minds should be discovered and utilised in our manufactures. In other words, the man of science should be encouraged to help in the development of industries. Efforts should be made to ensure that industrial leaders are well equipped with scientific knowledge and the principles of technology, and in our schools less time should be given to dead languages and more to the efficient study of science, applied mathematics and other subjects demanded by modern life. Finally, everyone should endeavour, each in his own sphere of influence, to direct, without any exaggeration, but with profound conviction, the attention of our commercial classes to the fact that technical education of the best and most thorough kind is an urgent and crying necessity if we are to maintain a leading position among the nations of the world.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 11, 1902.—"An Error in the Estimation of the Specific Gravity of the Blood by Hammerschlag's Method, when employed in connection with Hydrometers." By A. G. **Levy**, M.D. (London). Communicated by Sir Victor Horsley, F.R.S.

Hammerschlag's method may be briefly described as the adjustment of the specific gravity of a mixture of chloroform and benzol by small successive additions of either constituent until it corresponds to the specific gravity of the blood, the test of the attainment of this condition being that a small drop of the blood, when immersed in the mixture, shall remain suspended without any very obvious tendency to rise or sink. The specific gravity of the mixture is then estimated by means of a hydrometer.

This method is known to be liable to an error of varying magnitude. The investigation into the source of this error resolved itself into a series of observations upon the effect of the low value of the surface tension of the above mixture upon the readings of hydrometers immersed therein. The surface tension of the mixture may be taken as 2·75 mg. per mm., and that of clean tap water as 7·3 mg.

The readings of four different hydrometers when immersed in a mixture of the specific gravity 1·000 are appended:—

No. of hydrometer.	No. 1.	No. 2.	No. 3.	No. 4
Reading of scale in a chloroform benzol mixture of specific gravity = 1·000	1·002	1·003	1·0095	1·010

The author found, however, that the *calculatea* errors exceeded in each instance those *observed*, and the results are contrasted in the following table:—

Hydrometer.	Observed error.	Calculated error.
1	0·002	0·0035
2	0·003	0·0056
3	0·095	0·0123
4	0·010	0·0146

The difference was accounted for satisfactorily by an innate error demonstrated to exist in each hydrometer, evidently due to the standardisation of the instrument in unclean (*i.e.* greasy) water, which possesses a lower surface tension than 7·3 mg. This appears to be a common fault in hydrometers.

Chemical Society, December 17, 1902.—Prof. Emerson Reynolds, F.R.S., president, in the chair.—The following papers were read:—A reagent for the identification of carbamide and of certain other nitrogen compounds, by Mr. H. J. H **Fenton.** Among the derivatives of methyl-furfural previously described by the author is one which may be either methyl-furil or the isomeric ketone-aldehyde; this in presence of a trace of acetyl chloride gives with carbamide and monoalkyl carbamides a brilliant blue colour.—The rate of decomposition of diazo-compounds, part ii., diazo-compounds of the naphthalene series, by Messrs. **Cain** and **Nicoll.** The reaction is monomolecular, but after a time is not strictly so owing to the formation of azo-colours.—State of carbon dioxide in aqueous solution, by Prof. J. **Walker.** It is shown that obedience to Ostwald's dilution law in the case of solutions of carbonic acid gas and similar substances affords no evidence as to the amount of real carbonic acid present in solution.—Qualitative separation of arsenic, antimony and tin, by Prof. J. **Walker.** The mixed sulphides are dissolved in soda solution and oxidised with sodium peroxide; from the solution, stannic oxide is precipitated by boiling with ammonium chloride, whilst arsenic and antimony can be separated in the usual manner.—The hydrates and solubility of barium acetate, by Prof. **Walker** and Mr. W. A. **Fyffe.** The solubility curve consists of three portions, all convex to the axes and representing the solubilities of a trihydrate, monohydrate and anhydrous salt respectively.—*cis*- and *trans*-ββ Dimethylglutaric acid, and the separation of the *cis* and *trans* forms of substituted glutaric acids, by Messrs. J. F. **Thorpe** and W. J. **Young.**—Constitution of metallic cyanides, by J. E. **Marsh.** Metallic cyanides, with the exception of those of silver and mercury, are oxidised by permanganate to cyanates, whence the author concludes that in general these cyanides have the isonitrile structure, the exceptions being nitriles.—Auto-reduction of mercury and silver cyanides, by Messrs. **Marsh** and **Struthers.**—Note on the action of acids on cellulose, by Miss M. **Gostling.** The black residue formed when cellulose is heated with strong haloid acids closely resembles the artificial humus obtained by the action of dilute acids on sugars.—Nitrotartaric acid and some of its esters, by Prof. P. F. **Frankland,** Mr. H. L. **Heathcote** and Miss **Hartle.**—The nitration of diethylmonobenzoyl and mono-*p*-toluyl tartrates, by Prof. P. F. **Frankland** and Messrs. **Heathcote** and **Green.** A preliminary description of these derivatives of tartaric acid.—Interchange of halogen for hydroxyl in chloro- and bromo-naphthalenediazonium hydroxides, by Dr. **Orton.**—Purpurogallin, by Messrs. A. G. **Perkin** and A. B. **Steven.** A description of acyl and alkyl derivatives is given and the products of decomposition by potassium hydroxide are found to be two ketonic substances of the formula $C_{11}H_6O_5$.—Note on the destructive distillation of ethyl gallate, by Mr. A. G. **Perkin.** In addition to pyrogallol and ethyl alcohol, there is formed 7 per cent. of rufigallic acid; the latter is also produced by the distillation of gallic acid itself.—A series of double chromates, by Mr. S. H. C. **Briggs.** A double salt of the composition $(NH_4)_2Ni(CrO_4)_2,6H_2O$ and a second of the composition $(NH_4)_2Ni(CrO_4)_2,2NH_3$ have been obtained, as well as the corresponding salts of copper, zinc and cadmium, by the action of ammonia on the appropriate dichromates.

Linnean Society, December 18, 1902.—Prof. Sydney H. Vines, F.R.S., president, in the chair.—Notes on some Copepoda from the Faröe Channel, by Mr. Thomas **Scott.** Waterlogged and partly decayed pieces of wood are frequently brought up in the dredge, and these fragments harbour Entomostraca. In this manner, some of the rare forms, commented on in this paper, were obtained. Three new species and a new variety of another previously characterised species were described.—The Amphipoda of the *Southern Cross* Antarctic expedition, with remarks on bipolarity, by Mr. A. O. **Walker.** The collection was made between Cape Adare in April, 1899, and Franklin Island in February, 1900, the larger part after the death of the zoologist of the expedition (Mr. N. Hanson) by Mr. Anton Fougner, partly by dredging. The species obtained have a striking resemblance to forms found in Arctic seas, though only one species has been deemed identical, *Ampelisca macrocephala*, Lilljeb. The author does not put forward any theory of his own to account for the similarity of forms in the Arctic and Antarctic regions with their absence from the intervening tropical seas, but he adduces many instances of it, especially the distribution of the genus Orchomenopsis, Sars, which is widely spread in waters of low temperature. One new genus, Oradarea, is described with a single species, from Cape Adare.

—The deep-sea isopod, *Anuropus branchiatus*, Bedd., and some remarks on *Bathynomus giganteus*, A. M.-Edw., by Dr. H. J. **Hansen.** The aberrant genus Anuropus was described by Beddard in the report of the *Challenger*, vol. xvii., from a single specimen brought up from 1070 fathoms off the coast of New Guinea. The author has recently examined this specimen during a visit to the British Museum, and supplements the original description in several important particulars.

Royal Microscopical Society December 17, 1902.—Dr. Hy. Woodward, F.R.S., president, in the chair.—Mr. **Rousselet** exhibited an apparatus designed by Mr. H. Bausch for drawing objects natural size. It was described in the Society's *Journal* in 1900, but had not been previously exhibited.—The Rev. R. **Freeman** read a paper by Mr. F. R. **Dixon-Nuttall** and himself on the genus Diaschiza which was illustrated by drawings shown on the screen by means of the epidiascope. The authors alluded to the confusion in which this genus of rotifers had remained to the present time and pointed out the errors into which Gosse had fallen. They described the characters of those species which they considered should be included in the genus and also described a new species.—Mr. E. R. **Turner** gave a description of Lumière's process of taking photomicrographs in colours.

EDINBURGH.

Royal Society, December 1, 1902.—Lord Kelvin, president, in the chair.—Prof. Cossar **Ewart** read a paper on the callosities of the horse, in which from a study of their occurrence in the fœtus he concluded that the wrist callosity corresponded to the supplementary pad in the foreleg of the dog, and that the hock callosity corresponded to a pad which occurred in the banded ant-eater. There was no evidence of the callosities being remnants of glandular organs. The evidence was rather in favour of Beddard's recent suggestion that they were remnants of tactile organs such as occur in marsupials, lemurs, and the ungulate hyrax.—Prof. **Ewart** also read a paper on a new horse from the Western Islands, *Equus Caballus Celticus.* This newly recognised variety was a pony which took in the west the same place which the Arab took in the east. It agreed with asses and zebras in having no callosities on the hind legs, and it resembled the Przevalsky horse of Central Asia in having short hairs on the upper part of the tail just as in mules. It was yellow dun in colour, had black fetlocks, small head, small ears, prominent eyes, and had stripes and dorsal band, and fragments of stripes on legs, shoulder and face. In many characteristics, it differed decidedly from the Przevalsky horse, and nothing like it was to be found in the east, the recognised home of the Arab. It was found in Iceland, Faeroe, Barra and other small islands of the outer Hebrides, also in Connemara. From the drawings of Palæolithic man and from the bones found in caves, we are able to distinguish two kinds of horses, a large and a small size, and it was suggested that the Celtic pony represented the small-sized horse known to Palæolithic man. The evidence disproved the once prevalent view that all the various breeds of European horses were descended from the one domesticated stock which originated in the east. Dr. Munro thought that Prof. Ewart's paper was of great anthropological importance as furnishing additional evidence as to the continuity of man and his domesticated animals from Palæolithic times, and so giving the *coup de grace* to a fetish which had existed for many years in this country, that Palæolithic man had died out and all his civilisation become extinct before the appearance of Neolithic man.

PARIS.

Academy of Sciences, December 29, 1902.—M. Bouquet de la Grye in the chair.—M. Mascart was elected a vice-president for the year 1903.—On the presence of argon in the gases from the Bordeu spring at Luchon, and on the presence of free sulphur in the sulphurous water from the cave and its vapours, by M. Henri **Moissan.** An analysis of the gases from this spring, carefully collected in the absence of air, showed the presence of 2·56 per cent. of argon, 1·22 per cent. of methane, the remainder of the gas consisting of nitrogen. The water and the vapour from it contained free sulphur.—On a new preparation of the silicon hydride, Si_2H_6, by M. Henri **Moissan** (see p. 233).—Experimental cultures in the Mediterranean region: modifications in the anatomical structure, by M. Gaston **Bonnier.** Experimental cultures of the same species of plant were made in the same soil at Fontainebleau and at La Garde, near Toulon, and a minute account of the anatomical differences observed is given.—On the conditions necessary that a fluid should be in stable equilibrium, by M. P. **Duhem.**—On the velocity with which the different varieties of X-rays are propagated in air and in different media, by M. R. **Blondlot.** X-rays of varying penetrative power were examined, and the velocities determined in air, paraffin wax, beechwood, vaseline oil and essence of turpentine, and it was found that within the limits of experimental error the velocity of the different varieties of X-rays was the same in all the media, being equal to that of light in air.—On the germinating power of seeds exposed to sunlight, by M. Emile **Laurent.** Sunlight exerts an injurious influence upon the seeds or dried fruits of the higher plants, the first effect being a delay in the germination and then the death of the embryos. In general, moderately bulky seeds are less sensitive to the effects of sunlight than smaller ones, especially if the latter have dark coatings.—Notice on M. Millardet, by M. **Bornet.**—Anomalies of the earth's magnetic field on the Puy de Dome, by MM. B. **Brunhes** and **David.** Report by M. Bouquet de la Grye.—New observations on the volcanic eruptions at Martinique, extracts from letters addressed by M. **Lacroix** to MM. Darboux and Michel Levy.—Observations of the comet *d* (1902) made at the Observatory of Algiers with the 31·8 cm equatorial, by MM **Rambaud** and **Sy.** Observations of magnitude, apparent positions of the comet and of comparison stars.—Observations of the Perseids, Leonids and Bielids made at Athens in 1902, by M. D. **Eginitis.** The Perseids were observed under favourable conditions between August 8 and 13; they were less numerous than in the five preceding years. The conditions for the observation of the Leonids and Bielids were not so favourable.—On entire functions, by M. **Hadamard.**—Remark relating to my note on the approximate representation of functions, by M. W. **Stekloff.** A correction of an error in a previous note.—On the fundamental formula of Dirichlet relating to the determination of the number of classes of definite binary quadratic forms, by M. Mathias **Lerch.**—An application of the theory of residues to the analytical prolongation of Taylor's series, by M. Ernst **Lindolof.**—On a plane representation of space and its application to graphical statics, by M. B. **Mayor.**—Study of the magnetofriction of the anode bundle, by M. H. **Pellat.** In previous papers, the author has described a series of phenomena which are produced when a kathode or anode flux is submitted to the action of an intense magnetic field and which are inexplicable by the laws of electromagnetism. The assumption of the existence of an anisotropic friction affecting the particles in motion, very great in the sense perpendicular to the lines of force of the magnetic field and much less in the direction of the lines of force, serves to explain the observed phenomena perfectly, and the name magnetofriction is proposed as a general name for this phenomenon. Experiments are described in which the effect of varying the pressure and nature of the gas is shown.—On the emanation from phosphorus, by M. Eugène **Bloch.** It has been known for some time that air placed in the neighbourhood of a stick of phosphorus becomes a conductor of electricity. The study of this phenomenon having led to contradictory explanations in the hands of Barus, G. C. Schmidt and Harms, further experiments have been carried out by the author, who concludes that the conductivity of dry air which has passed over phosphorus is due to ions of very feeble mobility which serve as nuclei of condensation for water vapour, even non-saturated. The question of the exact chemical mechanism by which these ions are produced, whether their formation is due to the production of a definite chemical compound such as ozone or an oxide of phosphorus, or to a simple modification of the oxygen, requires further study.—On the Hall effect and the mobility of the ions of a saline vapour, by M. Georges **Moureau.**—On a new electric accumulator, by M. D. **Tommasi.** A description of the method of constructing the lead plates of an accumulator. The capacity obtained is 17·7 ampere-hours per kilogram of plates.—On the spectra of flames, by M. C. de **Watteville.** The method of M. Gouy is applied to the study of flame spectra in the ultra-violet. The results given tend to show that temperature is the only factor which influences the constitution of spectra.—On the proportion of hydrogen in atmospheric air, by M. Anatole **Leduc.** A reply to the criticisms of M. A. Gautier, the author maintaining the accuracy of his original conclusions.—The thermal study of metaphosphoric acid, by M. H. **Giran.**—On some sources of mineral gases, by

M. Ch. **Moureu.** An analysis of the gas arising from mineral springs in the region of the Pyrenees. All the gases examined contained argon in amounts varying from 0·9 to 1·8 per cent. Only one of the five samples examined could be shown to contain helium.—On cryolites, by M. E. **Baud.** A thermochemical paper.—On a new method for the volumetric estimation of hydroxylamine, by M. M. L. J. **Simon.** Hydroxylamine oxalate can be titrated with potassium permanganate in neutral solution in a perfectly definite manner, and an exact method for the titration of any salt of hydroxylamine can be based upon this fact.—On the method of manufacture of arms of the bronze period, by M. F. **Osmond.** By the application of the methods of micrographic analysis to specimens of ancient bronze implements, it has been found possible to trace differences in the mode of manufacture, and it is regarded as possible that a methodical study on these lines may lead to the classification of bronze implements with regard to time.—On the composition and constitution of the hydrates of sulphuretted hydrogen, by M. de **Forcrand.** The method of study is based upon the measurement of the dissociation pressures.—On the dibromide of metho-ethenylbenzene, by M. M. **Tiffeneau.**—On the synthesis of an aromatic hydrocarbon derived from camphor, by M. C. **Chabrié.** A study of the interaction of benzene and monochlorocamphor in the presence of aluminium chloride.—On a method for transforming monochloro- and monobromo-derivatives of hydrocarbons into monoiodo derivatives, by M. F. **Bodroux** (see p. 233).—On the decomposition of some di- and tri-basic organic acids, by MM. Œchsner de **Coninck** and **Raynaud.** Malonic, succinic, tartaric, malic and citric acids were heated with glycol, glycerol and with sulphuric acid, and the decomposition products noted.—On the nature of the nitrogen compounds which exist in the soil at different heights, by M. C. **Andre.**—Normal hermaphrodism in fishes, by M. Louis **Roule.**—Organic variations in carnivorous fowls of the second generation, by M. Frédéric **Houssay.**—On the origin of the *Nebenkirn* and the nuclear movements in the spermatid of *Notonecta glauca*, by MM. J. **Pantel** and R. de **Sinéty.**—On the otocysts of polychætal annelids, by M. Pierre **Fauvel.**—On the nuclear emissions observed in the Protozoa, by MM. A. **Conte** and C. **Vaney.** The conclusion is drawn that the nucleus takes part directly in the formation of zymogen grains, and consequently it is of high importance in the phenomena of digestion, both intracellular and extracellular.—The organisation of *Trepomonas agilis*, by M. P. A. **Dangeard.**—On intermediary wood, by M. Paul **Vuillemin.**—The influence of formaldehyde upon the vegetation of some fresh-water Algæ, by M. Raoul **Bouilhac.** In presence of light, certain moulds can grow in solutions containing small quantities of formaldehyde, and can utilise the latter as food.—On the vegetation of Lake Pavin, by M. C. **Bruyant.**—On a conidian form of the fungus of black rot, by M. C. **Delacroix.**—On some connections between the genesis of metalliferous layers and general geology, by M. L. de **Launay.**—On the age of the old volcanic formations of Martinique, by M. L. **Giraud.**—On the discovery of a new granitic *massif* in the valley of the Arve, between Servoz and Les Houches, by MM. E. **Haug** and P. **Corbin.** Cryogenin in fevers, by M. **Carrière.** Cryogenin (metabenzaminosemicarbazide) has a marked effect in lowering the body temperature, especially in the case of fevers, and appears to be free from toxic properties. Its antithermic action is variable, but is especially strong in tuberculous subjects.

DIARY OF SOCIETIES.

THURSDAY, JANUARY 8.

MATHEMATICAL SOCIETY, at 5.30.—A Method of representing Imaginary Points by Real Points in a Plane: Prof. A. Lodge.—On the Mathematical Expression of the Principle of Huygens: Dr. J. Larmor.—Generational Relations for the Abstract Group simply Isomorphic with the Linear Fractional Group in the Galois Field $[2^n]$: Prof. L. E. Dickson.—Series connected with the Enumeration of Partitions (second paper): Rev. F. H. Jackson.—On the Jacobian of Two Binary Quantics considered Geometrically: Prof. W. S. Burnside.—On the Resolution of some Skew Invariants of Binary Quantics into their Factors in Terms of their Roots: Prof. W. S. Burnside.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Notes of Recent Electrical Design: W. B. Esson.—Notes on the Manufacture of Large Dynamos and Alternators: E. K. Scott.

FRIDAY, JANUARY 9.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Preliminary Note on the Possible Existence of two Independent Stellar Systems: F. A. Bellamy and H. H. Turner.—New Double Stars detected with the 17¼-inch Reflector in the Year 1902: Rev. T. E. Espin.—The Sun's Stellar Magnitude, and the Parallax of Binary Stars: J. E. Gore.

GEOGRAPHICAL ASSOCIATION, at 3.30.—The Australian Commonwealth: Sir John A. Cockburn.

MONDAY, JANUARY 12.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Recent Volcanic Eruptions in the West Indies: Dr. Tempest Anderson.

TUESDAY, JANUARY 13.

ROYAL INSTITUTION, at 5.—Physiology of Digestion: Prof. A. Macfadyen.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Electric Automobiles: H. F. Joel.

WEDNESDAY, JANUARY 14.

SOCIETY OF ARTS, at 8.—Industrial Trusts: Prof. W. Smart.

THURSDAY, JANUARY 15.

ROYAL INSTITUTION, at 5.—Pre-Phœnician Writing in Crete and its Bearings on the History of the Alphabet: Dr. A. J. Evans, F.R.S.

FRIDAY, JANUARY 16.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Measurement of Water: Prof. W. C. Unwin, F.R.S.

ROYAL INSTITUTION, at 9.—Low Temperature Investigations: Prof. Dewar, F.R.S.

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Cutting Angles of Tools for Metal Work, as Affecting Speed and Feed: H. F. Donaldson.

CONTENTS.

PAGE
Fire Prevention. By Emeritus 217
Two Books on Immersed Ships. By C. V. B. . . 218
Wolley's Collection of Birds' Eggs 219
The Wanderings of a Naturalist in South America. By J. W. E. 220

Our Book Shelf:—

Massee: "European Fungus-Flora, Agaricaceæ . 221
Porter: "An Introduction to Physiology."—E. H. S. 222
Groth: "The Potash Salts; their Production, and Application to Agriculture, Industry and Horticulture."—R. W. 222
Ikin and Lyster: "Advanced Hygiene" 222
Smith: "Material of Machines" 222

Letters to the Editor:—

Traces of Past Glacial Action in the Orange River Colony, South Africa.—G. E. H. Barrett-Hamilton 223
Risley's "Tribes of Bengal.—S. M. Jacob 223
Local Floras of India.—W. Botting Hemsley, F.R.S.; The Reviewer 223
The Similarity of the Short-period Barometric Pressure Variations over Large Areas. (*With Diagrams.*) By Dr. William J. S. Lockyer . . . 224
Education in Germany and England. By Dr. F. Mollwo Perkin 226
Tidal Currents in the Gulf of St. Lawrence. By G. H. D. 228
Johannes Wislicenus 228
Notes 229

Our Astronomical Column:—

Comet 1903 *d* 233
Observations of Variable Stars 233
The Spectrum of ε Aurigæ 233
Observations with a Binocular Telescope 233
Recent American Botany. (*With Diagram.*) By Prof. T. D. A. Cockerell 234
Earthquake Observations in Galicia. By Prof. J. Milne, F.R.S. 235
Pilot Charts of the Meteorological Office 235
Starving a Parasite 235
The North of England Science Conference. By A. T. S. 236
University and Educational Intelligence 237
Societies and Academies 238
Diary of Societies 240